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ENTOMOLOGY.<sup>1</sup>

ON THE SYNONYMY OF THE APPLE-LEAF CREASER, *ORNIX GEMINATELLA* (Packard).—Having lately had occasion to study the Tineidæ infesting apple leaves in Illinois, I have been puzzled over the proper name of a common species which inhabits a tent-shaped mine on the under leaf-surface. It is the insect that Mr. A. E. Brunn has discussed<sup>2</sup> as *Ornix prunivorella* Chambers, but which I believe to be the same as Packard's *Lithocolletis geminatella*. The agreement of my specimens of the various stages of the insect, with the descriptions of these species as given by Packard, Chambers and Brunn, led to a careful examination of the literature treating of the two species, the results of which I briefly summarize below. The subject is more fully discussed in a paper to be published in the Fifteenth Report of the State Entomologist of Illinois.

The various stages of *Lithocolletis geminatella* were described and figured by Dr. Packard in 1869.<sup>3</sup> The description of the moth is rather brief, but the figure is excellent. The larva is said to be of a pale livid reddish color, with the head and cervical shield black; and to mine the leaves of apple and pear.

Two years later Chambers published<sup>4</sup> an article on the described species of *Lithocolletis*, in which he surmises that *geminatella* does not properly belong to this genus.

In the *Canadian Entomologist* for March, 1873, Mr. Chambers published a description of *Ornix prunivorella*, stating that the larva mines the leaves of the apple and wild cherry, and giving a brief account of its habits.

In an article on the Food-plants of the Tineina, published somewhat later,<sup>5</sup> Mr. Chambers mentions this species as feeding on wild cherry, but strangely enough omits it from the list of those feeding upon apple, although in connection with the original description he remarks that "the larva mines the leaves of apple trees." In this list *Lithocolletis geminatella* is not mentioned.

In 1882 Lord Walsingham published<sup>6</sup> some "Notes on the Tineidæ of North America." This paper was the result of a study

<sup>1</sup> This department is edited by Prof. J. H. Comstock, Cornell University, Ithaca, N. Y., to whom communications, books for notice, etc., should be sent.

<sup>2</sup> Tineidæ Infesting Apple Trees at Ithaca. Sec'd Rept. Corn. Univ., Exp. Stat., p. 157.

<sup>3</sup> Guide to Study of Insects, p. 353; Plate viii., Fig. 15.

<sup>4</sup> Can. Ent., vol. iii., p. 133.

<sup>5</sup> Bull. U. S. Geol. Surv., vol. iii., p. 133.

<sup>6</sup> Trans. Am. Ent. Soc., vol. x., p. 194.

of several American collections of these moths, many of the specimens being types of American species. On page 194, in speaking of certain of these specimens, he says:—

“I think these may be *Ornix prunivorella* Chamb., although that author does not record that the larva of that species feeds on apple or pear. These specimens are not in good condition, and it is impossible in so difficult a genus as *Ornix* to be quite certain to what species they belong.

“They are the types of *Lithocolletis geminatella* Packard, according to the label attached to the second specimen, but they undoubtedly belong to the genus *Ornix*.”

From the statement just quoted, that Chambers does not record the apple-feeding habits of *O. prunivorella* it seems evident that Lord Walsingham had been misled by the omission in the list of food-plants noted above.

As the leaves of this species are quite characteristic, I sent specimens to Dr. Packard with the request that he examine them to see if they were similar to the ones from which he bred *L. geminatella*. In reply he says: “I have examined the *Ornix prunivorella*—two larvæ—white, exactly of the size and shape of my *geminatella*, which I have not seen for nearly twenty years. Mine was a uniformly brown caterpillar, but the spots on prothoracic segment were not so distinct as appears in your specimen—yet in my figure I see they are represented. I suppose the alcohol brings out the tubercles more distinctly than in life. It may be safe to regard the two species as identical, since Chambers bred it from the apple. On turning to Emerton’s original drawing I see the spots on the thorax are represented just as in your specimen. My description on the sketch says: ‘Color pale livid reddish, suspended by a thread to the tree.’ On the whole, then, I conclude that the larvæ you send are those I described as *L. geminatella*.”

The difference in the colors of these larvæ may easily be accounted for on the supposition that Dr. Packard’s specimen was immature, for, as Mr. Brunn has remarked, these larvæ are flesh-colored when young.

In the light of these observations I believe that I am justified in treating these supposed species as the same, and, as Dr. Packard’s name has priority, in calling the insect *Ornix geminatella* (Pack.).—*Clarence M. Weed.*

CONTAGIOUS DISEASES OF INSECTS. — Professor Forbes, in his address as retiring president of the Cambridge Entomological Club,<sup>1</sup> discusses the present state of our knowledge concerning contagious insect diseases. The address contains a statement of so many facts that it is not possible to abstract it in a short space. It should be read by all interested in the biological side of entomology that

<sup>1</sup> *Psyche*, Vol. V., pp. 3-12.

have not occasion to keep track of the literature concerning the minute organisms that cause disease. A few of the more general points can be stated here. Contagious disease, wherever it has been traced to its origin, has proved to be the phenomenon of parasitism. This address is limited to a discussion of epidemics caused by Fungus or Protozoan parasites.

Of the Protozoan diseases of insects, *pebrin* of the silkworm is the best known example. There has been much discussion regarding the position of this parasite; but there can be no longer a reasonable doubt of its animal nature, or of its agreement in general characters with those forms now commonly included under the head *Sporozoa*, a parasitic subdivision of the Protozoa of which *Gregarina* is perhaps the best known type. The life history of this parasite is very simple, and may be thus briefly summarized.

The minute oval spores, colorless, highly refractile, homogeneous in appearance,  $4\ \mu$  long by  $2\ \mu$  wide, when swallowed with the food, penetrate in some way unexplained the cuticle of the alimentary canal, and, in the cells of the epithelium, open at one end and emit their contents, each in the form of an amœboid speck of protoplasm. This grows to a spherical body, and, by a process of internal segmentation common to the Sporozoa, is soon converted into a mass of spores, each like the original. These spores everywhere undergo a like development, and load all of the tissues with their products, slowly and gradually arresting all of the functions of life. Their vitality is temporary — Pasteur's experiments showing that they will not germinate five weeks after drying out — and the disease is consequently maintained only by virtue of its hereditary character.

Other forms of Microsporidia have been found in at least ten species of insects enumerated by Forbes.

Although pebrine, and presumably other diseases of this nature, can be conveyed to healthy insects by treating their food with the dejections of affected individuals, the economic application of these diseases is limited to artificial measures for developing and accelerating them wherever they may be found, and to the transfer of them from one species to another. For there is not the slightest probability that the Sporozoa can be artificially cultivated outside of the bodies of the animals that they infest.

The notable fungous diseases of insects are readily divisible into two principal groups: *Schizomycoses*, produced by Bacteria, and *Hyphomycoses*, due to Fungi that form a more or less evident mycelium of cylindrical threads (*Hyphomycetes* and *Pyrenomycetes*). These are roughly distinguishable in two important particulars: (1) The bacteria invade the body from within, by way of the alimentary canal; and the thread fungi penetrate from without through the skin or spiracles; (2) Death from a schizomycosis is followed by rapid decay, which soon reduces the tissues to a putrid

fluid; while after death from a hyphomycosis the often flaccid body hardens and mummifies without decay, usually swelling to more than its usual size, and frequently becoming covered with a flour-like efflorescence of spores or spore-like bodies.

These last characters distinguish the hyphomycoses from the *pébrine*, — the body mummifying in the latter, but shriveling at the same time and never covering itself with spores, unless with those of a common mould of *post mortem* development. Further, the *pébrine* mummy contains only the minute oval spores of the parasite, while that of a hyphomycosis contains either a mass of mycelial threads or large thick-walled, spherical spores, — the lasting spores of the *Entomophthora*, or, possibly, both spores and mycelium together.

Examples of Schizomycoses, diseases produced by bacteria, are *flacherie* of the silkworm and foul brood of bee larvæ. Among the hypomycoses are muscardine and the common house-fly fungus, *Empusa muscæ*. In fact, nine-tenths of the adult and larval insects found dead and stiff on fences, weeds, grass, etc., in ordinary collecting, are victims of these parasites.

THE PROGENITORS OF MYRIAPODS AND INSECTS. — Under this title Professor B. Grassi<sup>1</sup> discusses the classification of the Thysanura, describes several new species of *Lepisma*, gives an account of the anatomy of *Lepisma* and *Lepismina*, and discusses the musculature of Thysanura. The last topic is of especial interest at this time as bearing on the separation, proposed by Brauer, of insects into two groups of equivalent rank, the Apterygogenea and the Pterygogenea, the former group containing only the Thysanura, the latter, all other insects. Professor Grassi was unable to discover in the musculature of Thysanura any indication of the previous existence of wings, thus confirming Brauer's view that these insects were "originally wingless," instead of, as in the case of wingless forms in the higher orders, being descended from winged ancestors.

The longest article contained in the *Proceedings* of the Zoological Society of London, Part II., 1887, is by Mr. E. B. Poulton, and treats of the protective value of color and markings in insects. It contains the tabulated results of extensive experimental researches.

<sup>1</sup> Bull. Soc. Entomol. Ital. XIX. (1887), pp. 52-74.